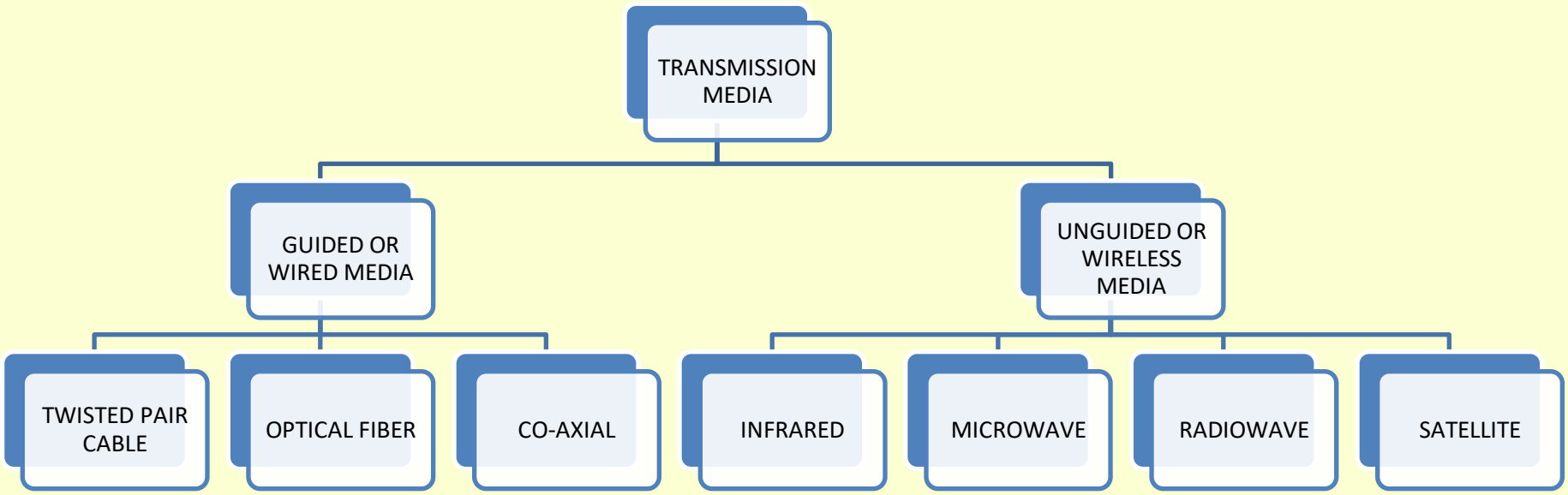
TRANSMISSION MEDIA AND THEIR COMPARISON

TRANSMISSION MEDIA

- **It is the way in which data is transmitted from one place to another or through which the message can travel from sender to receiver.**
- **In this each message can be sent in the form of data by converting them into binary digits.**
- **These binary digits are then encoded into a signal that can be transmitted over the appropriate medium**

TYPES OF TRANSMISSION MEDIA

1. Guided Media or Wired Media
2. Unguided Media or Wireless Media

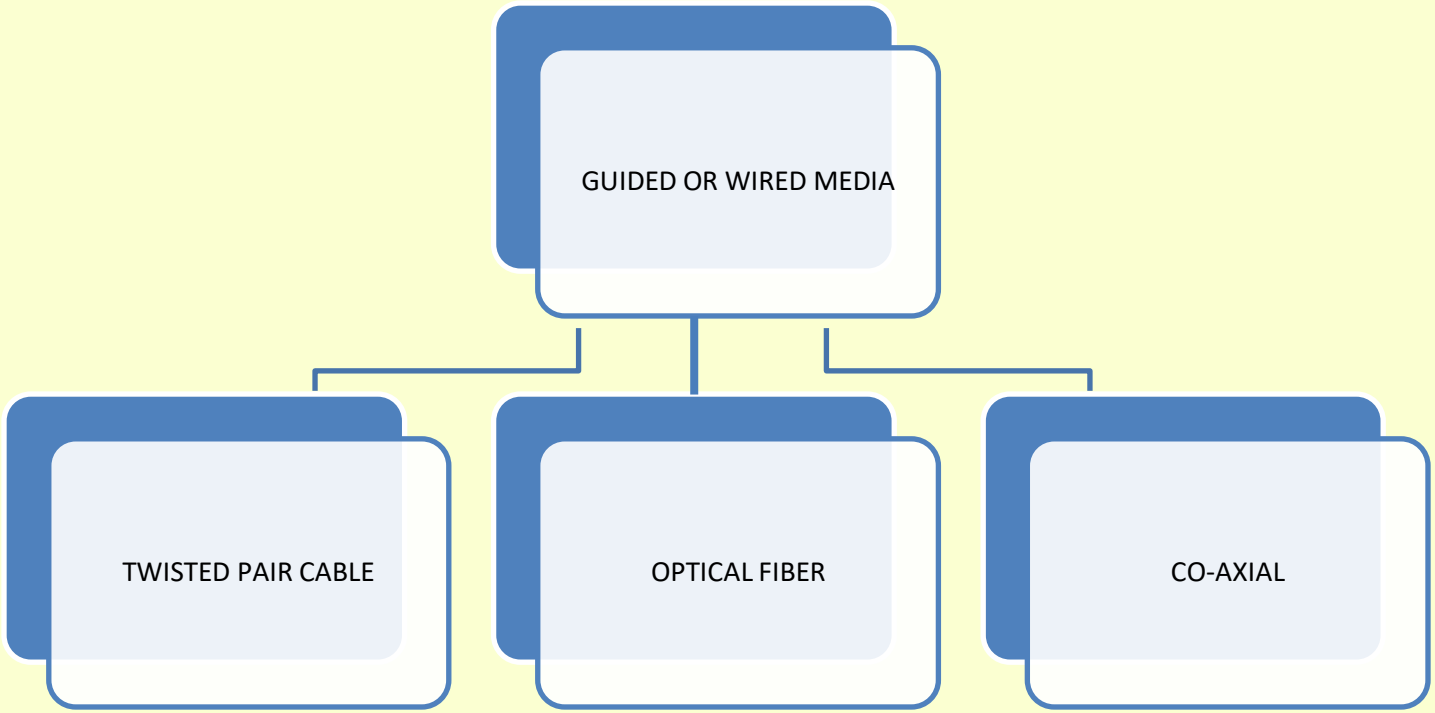


Specifications	Wired network	Wireless network
Speed of operation	Higher	lower compare to wired networks,
System Bandwidth	High	Low
Cost	Less as cables are not expensive	More costly wireless routers/access points/ adapters are expensive
Installation	Hard to install,requires more time	easy installation and need less time
Mobility	Limited	Not limited
Transmission medium	copper wires, optical fiber cables, ethernet	radiowaves or EM waves or or infrared
extension	requires hubs and switches	More area is covered by wireless base stations which are connected to one another.
Applications	LAN (Ethernet), MAN	WLAN, WPAN(Zigbee, bluetooth), Infrared, Cellular(GSM,CDMA, LTE)
Interference	Less Interference	Interference is
Quality of Service	Better	Poor due
Reliability	High compare to wireless counterpart, as manufactured cables have higher performance due to existence of wired technology since years.	Reasonably high, This is due to failure of router will affect the entire network.

WIRED NETWORKS

- Wired or Guided transmission media are the cables that are tangible or have physical existence.
- It is also known as Ethernet networks (LAN technology).
- A wired network is simply a collection of two or more computers, printers, and other devices linked by Ethernet cables/ any form of wired media.
- Ethernet is the fastest wired network protocol, with connection speeds of 10 megabits per second (Mbps) to 100 Mbps or higher.
- Computer must have an Ethernet adapter (sometimes called a network interface card, or NIC) to connect with wire.
- Most of the network topology uses wired networks

WIRED OR GUIDED NETWORKS



TWISTED PAIR CABLE

A twisted pair cable comprises of two separate insulated copper wires, which are twisted together and run in parallel. The twists between are helpful in reducing noise(electro-magnetic interference) and crosstalk.

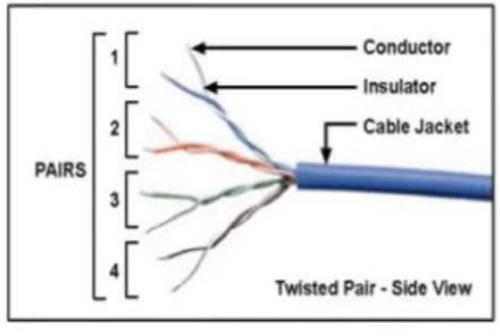
The copper wires are typically 1mm in diameter. One of the wires is used to transmit data and the other is the ground reference.

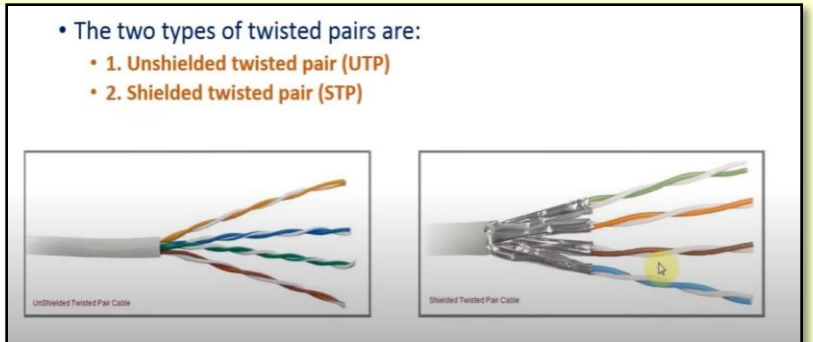
Reason for Twisting

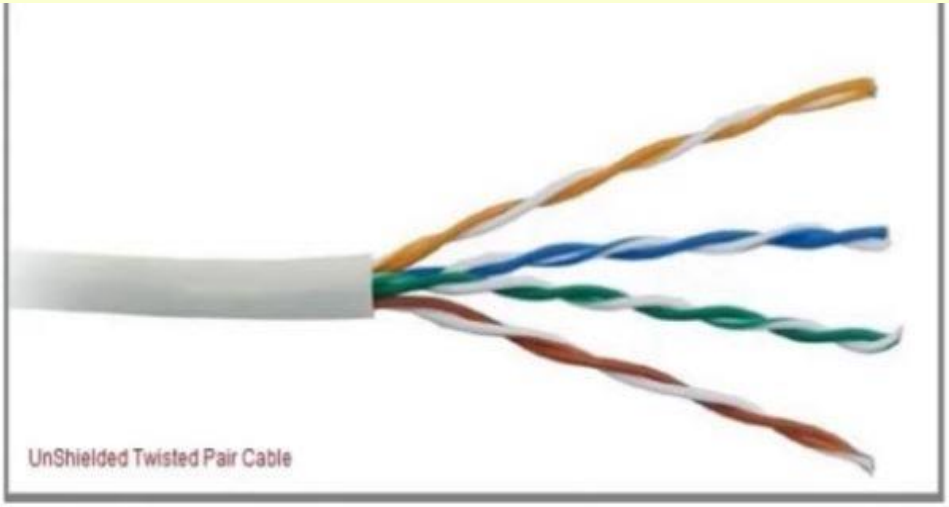
All transmissions are prone to noise, interferences, and crosstalks. When the wires are twisted, some part of the noise signals is in the direction of data signals while the other parts are in the opposite directions. Thus the external waves cancel out due to the different twists. The receiver calculates the difference in the voltages of the two wires for retrieving data. Thus a much better immunity against noise is obtained.

Applications of Twisted-Pair Cables to provide voice and data channels.

- In telephone lines
- In DSL lines
- In LANs







- **Unshielded twisted pair (UTP):-**
  - UTP is more common.
  - UTP cost less than STP and easily available due to its many use.
  - Due to its low cost, UTP cabling is used extensively for local-area networks (LANs) and telephone connections.
  - UTP cables consist of 2 or 4 pairs of twisted cable.
  - Cable with 2 pair use RJ-11 connector and 4 pair cable use RJ-45 connector.

RJ-11	RJ-45
6 pin	8 pin
	

- RJ-45 connectors is used with Ethernet cables in computer networking.
- RJ-11 connectors is used in connecting telephone units.

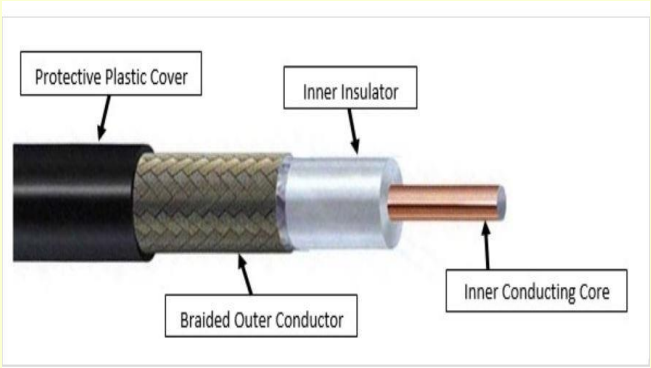
- **Shielded twisted pair (STP):-**
  - This type of cable has a metal foil covering which encases each pair of insulator conductors.
  - Electromagnetic noise penetration is prevented by metal casing. Shielding also eliminates crosstalk.
  - It is similar to UTP but has a mesh shielding that's protects it from EMI which allows for higher transmission rate.
- It is more expensive than coaxial and unshielded twisted pair.

CO-AXIAL CABLE

1. Coaxial cables, commonly called coax, are copper cables with metal shielding designed to provide **immunity against noise and greater bandwidth**.
2. Coax can **transmit signals over larger distances at a higher speed** as compared to twisted pair cables.

Applications of Coaxial Cables

- In analog telephone networks: A single coaxial network can carry about 10,000 voice signals.
- In digital telephone networks: A coax has a data rate of 600 Mbps.
- In cable TV networks
- In traditional Ethernet LANs
- In MANs



OPTICAL FIBER

1. Optical fiber cables are transparent, flexible fibers made up of glass or plastic through which light waves can pass.
2. Fiber optic cables need to be connected so that there is no leakage of light signals

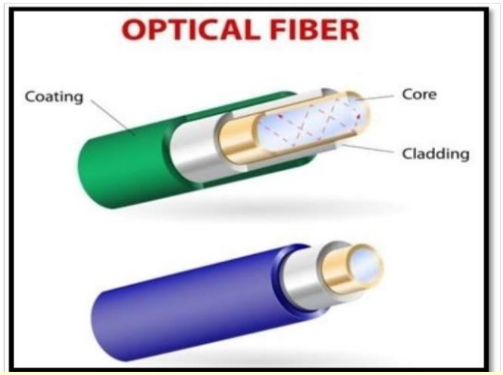
Structure of a Fiber – Optic Cable

A cross section of a fiber optic cable reveals three parts −

a) Core – It is the innermost portion of an optical fiber through which light propagates

b) Cladding – The core is surrounded by a glass cladding. The glass of cladding has a lower refractive index than the core. This enables total internal reflection of light waves in the core, and eventually propagation of light waves within the core.

c) Outer Coating or Jacket – It prevents light rays from outside to enter the optical fiber.



Applications of Optical Fiber Cables

- **Medical**
- **Defense/Government**
- **Data Storage**
- **Telecommunications**
- **Networking**
- **Industrial/Commercial**

  Broadcast/CATV- wiring CATV, HDTV, internet, video on-demand and other applications

Cable	Twisted pair	Coaxial cable	Fiber optic
Signal form	electricity	electricity	Light
cost	least	moderate	High
speed	low	moderate	High
Ease of use	Easy to install	Professional installation	Professional installation
reliability	low	moderate	High
Real life application	Telephone network	Tv cable	Data transmission & telephone line
Data transmission rate	10Mbps – bps	100Mbps	>100Gbps
Data transfer range	100m	185m - 500m	-